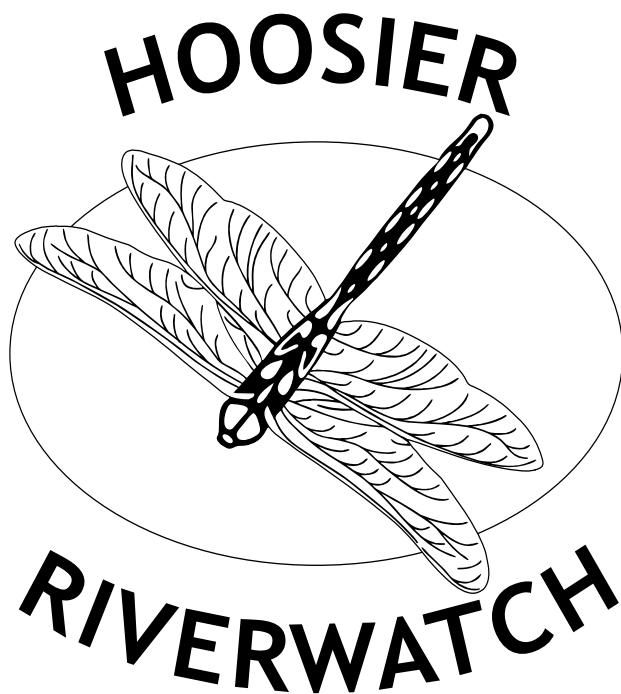


# Volunteer Stream Monitoring Training Manual



For more information about the Hoosier Riverwatch program, a schedule of upcoming workshops, or to be included on the *Riffles & Pools* newsletter mailing list, please contact the Hoosier Riverwatch office.

**HOOSIER RIVERWATCH**  
**Natural Resources Education Center**  
**Fort Harrison State Park**  
**5785 Glenn Road**  
**Indianapolis, IN 46216-1066**

Phone: (317) 541-0617  
Fax: (317) 562-0790

E-mail: [riverinfo@dnr.state.in.us](mailto:riverinfo@dnr.state.in.us)  
Website: [www.state.in.us/dnr/soilcons/riverwatch](http://www.state.in.us/dnr/soilcons/riverwatch)

This manual is written as a supplement to the  
*Field Manual for Global Low-Cost Water Quality Monitoring*  
by Stapp and Mitchell. To obtain a copy contact:

Earth Force - GREEN  
1908 Mount Vernon Avenue, Second Floor  
Alexandria, VA 22301  
(703) 519-6877  
[www.earthforce.org](http://www.earthforce.org)

The third edition of this manual was revised by Lyn Hartman and Jan Hosier in 2003.  
The second edition was written by Lyn Hartman and Mandy Burk in 2000.  
The first edition was written by Sarah Hippensteel and edited by Gwen White in 1997.  
The beautiful large-scale graphics were created by Sarah Beth Lauterbach,  
unless otherwise indicated.



Hoosier Riverwatch is a program of the Indiana Department of Natural Resources - Division of Soil Conservation and Division of Fish & Wildlife in partnership with the Purdue University Agronomy Extension.  
Funding is provided by the Indiana Utility Regulatory Commission, Lake and River Enhancement, and Federal Sport Fish Restoration Program.

**EQUAL OPPORTUNITY EMPLOYER**

Under Title VI of the 1964 Civil Rights Act, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, the U.S. Government prohibits discrimination on the basis of race, color, national origin, age, sex, or handicap. If you believe that you have been discriminated against in any program, activity, or facility as described above, or if you desire further information please write to: Department of Natural Resources, Executive Office, 402 W. Washington St., Rm W256, Indianapolis, IN 46204, (317) 232-4020.

# Table of Contents

---

<b>Chapter 1</b>	<b>Welcome to Riverwatch</b>	
	How Do Volunteers Get Started?	1
	Water Quality Monitoring	3
	Safety	4
<b>Chapter 2</b>	<b>Designing a Water Study</b>	
	Identifying Your Watershed	7
	What is Your Watershed Address?	8
	Watershed Inventory & Setting Goals	14
	Planning a Water Study	16
	Quality Assurance and Quality Control	18
<b>Chapter 3</b>	<b>Habitat Assessment</b>	
	What is a Healthy Stream Habitat?	19
	What is the Riparian Zone?	20
	Citizens Qualitative Habitat Evaluation Index	21
	Site Map and Stream Flow	25
<b>Chapter 4</b>	<b>Chemical Monitoring</b>	
	Introduction & Hints for Performing Tests	29
	Standard Chemical Testing Instructions	35
	Standard Data Sheet Instructions	40
	Advanced Chemical Testing Instructions	42
	Advanced Data Sheet & Worksheet	65
<b>Chapter 5</b>	<b>Biological Monitoring</b>	77
	Sampling Methods	78
	Freshwater Mussels	83
	Identification	85
	Biological Monitoring Data Sheet	105
	Diversity Index	107
<b>Chapter 6</b>	<b>Data - What's Next?</b>	
	Data Analysis, Action & Evaluation	111
	Graphing	112
	Water Quality Standards	114
	Habitat Parameters for Selected Macroinvertebrates	115
	Watershed Analysis Posters	116
<b>Chapter 7</b>	<b>Data Reporting</b>	
	Volunteer Stream Monitoring Internet Database	121
	Volunteer & Organization Registration	122
	Stream Site Registration	124
	Database Recordkeeping Form	126
<b>Appendices</b>	<b>A Monitoring Equipment</b>	<b>D Glossary</b>
	<b>B Web Page Addresses</b>	<b>E Suggested Reading</b>
	<b>C What Can You Do...</b>	<b>F References</b>
	<b>G Extra Data Sheets</b>	

# Acknowledgements

---

The Hoosier Riverwatch *Volunteer Stream Monitoring Training Manual* was constructed with the contributions and suggestions of the following people and organizations through the years. Our apologies to anyone who has been inadvertently left off this list and our sincere thanks to all!

## Indiana Department of Natural Resources

Division of Entomology  
Division of Fish and Wildlife  
Division of Outdoor Recreation  
Division of Soil Conservation  
Deb Fairhurst  
Kim Guinnup  
Deborah Messenger  
Jim Ray  
Gwen White  
Bob Waltz

Stephanie Ayres  
Ian Crighton  
Claudia Denton  
Jim Gammon  
Art Henerlong  
William W. Jones  
Meg Larson  
Stewart Lewis  
Patrick McCafferty  
Arwin Provonsha  
Ed Rankin  
Stacy Renfro  
John Rouch  
Robert Vertrees  
Bob Williams

## Indiana Department of Environmental Management

Office of Water Management  
Rhonda Dufour  
Steve Hall  
Carol Newhouse  
Steve Newhouse  
Stacey Sobot

Past Hoosier Riverwatch Coordinators:  
Jason Bowling  
Sarah Hippensteel  
Jeff Muse

All Indiana Soil and Water Conservation Districts  
All Hoosier Riverwatch Level 3 Volunteer Water Monitoring Instructors  
Clinton River (Michigan) Watershed Council  
GLOBE Program  
Earth Force / Global Rivers Environmental Education Network  
Hach Company  
Illinois Department of Natural Resources  
Kentucky Water Watch  
LaMotte Company  
Ohio Department of Natural Resources  
Ohio Environmental Protection Agency  
Tennessee Valley Authority  
Student Watershed Research Project/Saturday Academy of Oregon  
Thames River Basin Partnership Initiative  
US Environmental Protection Agency

Hoosier Riverwatch acknowledges the US Environmental Protecting Agency and the Indiana Department of Environmental Management for partial funding of the program through Sections 104(b)(3) and 319 of the Clean Water Act.

# Welcome to Hoosier Riverwatch

Hoosier Riverwatch is a state-sponsored water quality monitoring initiative. The program was started in Indiana to increase public awareness of water quality issues and concerns by training volunteers to monitor stream water quality. Hoosier Riverwatch collaborates with agencies and volunteers to:

- ◆ Increase public involvement in water quality issues through hands-on training of volunteers in stream monitoring and cleanup activities.
- ◆ Educate local communities about the relationship between land use and water quality.
- ◆ Provide water quality information to citizens and governmental agencies working to protect Indiana's rivers and streams.

Hoosier Riverwatch will assist you and your organization in understanding the importance of protecting local streams. Voluntary participation is the key to the success of the statewide stream monitoring and education program. This manual provides information to help you begin a successful water quality monitoring program.

The first two chapters cover safety considerations, developing a study design, and background information on water quality and watersheds. Each of the next three chapters explains in detail how to perform habitat, chemical, and biological monitoring. The final two chapters relate to data analysis, action, and reporting. The Appendices provide numerous resources, including information on equipment, books, and websites. The final Appendix section is entitled "Copy Pages" - it includes blank copies of all the data sheets.

## How do Volunteers Get Started?

### Training Workshops

To start a successful local Hoosier Riverwatch program, you should attend a training workshop and thoroughly read this manual. Training Workshops are held around the state (generally from May-October), are free and open to the public, and provide hands-on monitoring experience. Once certified, volunteers may submit data to the Riverwatch online database. Contact us or check our website [[www.in.gov/dnr/soilcons/riverwatch](http://www.in.gov/dnr/soilcons/riverwatch)] for an updated training schedule.

**Level 1 Introductory Training** - introduces citizens and educators to water quality monitoring utilizing habitat, chemical, and biological assessment methods. Participants learn to use the GREEN Standard water monitoring kit. The sessions are about 6 hours in length and take place both inside and outdoors. After completion of this training, participants become "Certified Volunteer Monitors." These volunteers are able to perform stream testing, submit data to the statewide volunteer stream monitoring database, and teach students how to monitor. Level 1 training is open to any interested adult.

**Level 2 Advanced Training** - focuses on the use of the advanced Hach chemical testing kit and quality assurance and control techniques for better data collection. Participants who complete Level 2 become "Citizen Scientists." Level 1 training is a prerequisite.

**Level 3 Instructor Training** - requires application and acceptance into the program. Volunteer Instructors are certified to lead training workshops. Experience and Level 1& 2 training required.

## Equipment Grants

Hoosier Riverwatch has awarded grants to volunteer groups since 1996. These grant recipients form the foundation of the Hoosier Riverwatch volunteer stream monitoring network. Each grant provides up to \$500 of water monitoring equipment. In return, grant recipients agree to monitor their selected stream or river segments at least four times per year for two years. Recipients must also attend one or more training workshops and submit quarterly grant reports. Any school, nonprofit organization, or governmental agency in Indiana is eligible to apply. Contact the Hoosier Riverwatch office for grant guidelines and application procedures. Two different equipment grants (specific to different levels of chemical monitoring) are available:

**Standard Equipment Grants** - These include the GREEN/LaMotte Standard Water Monitoring Kit, which provides simplified chemical testing methods suitable for elementary and middle school students, as well as other groups interested in a less intensive training and monitoring program. This testing kit is faster and easier to use; however, it cannot detect chemicals at low concentrations and the results are less accurate. Recipients of the Standard Grant are required to attend a Level 1 training workshop to obtain the equipment.

**Advanced Equipment Grants** - These include the Hach Stream Survey Testing Kit #27120-00, which provides more advanced chemical testing methods. It is ideal for high school students, as well as adult groups interested in obtaining higher quality monitoring results. Many of the tests require multiple steps and close attention to detail, but volunteers who lack previous experience or education in water quality monitoring can accomplish them (with some practice). Recipients of the Advanced Grant must attend both Level 1 and 2 training workshops to obtain the equipment.

\* Additional equipment such as biological sampling nets and field manuals are included with both grants. Also, training requirements are waived for grant recipients who have previously attended the appropriate Level 1 and/or Level 2 Hoosier Riverwatch training workshops.

## Citizen/Individual Volunteer Participation

Although **individuals** can not receive equipment grants (because equipment grants are only awarded to organizations), you can still participate in the program! Stream monitoring equipment has been provided to many of the 92 county Soil and Water Conservation Districts (SWCDs) to act as "loaner equipment." Contact information for the SWCDs and a list of locations offering monitoring equipment for loan to trained Riverwatch volunteers is available on the Hoosier Riverwatch website ([www.state.in.us/dnr/soilcons/riverwatch](http://www.state.in.us/dnr/soilcons/riverwatch)). Of course, you can also purchase or make your own sampling equipment (see Appendix A).

## Organizing Your Group

To get a "Riverwatchers" group started in your area, begin by contacting existing organizations already involved with stream or lake activities. A successful Hoosier Riverwatch group can use the support of a well-organized and like-minded constituency. Some individuals and/or organizations that you may want to contact for support include: citizen and civic groups, local government officials, lake associations, university specialists, community health officials, water utilities, canoe or fishing clubs, and county Soil and Water Conservation Districts.

# Water Quality Monitoring

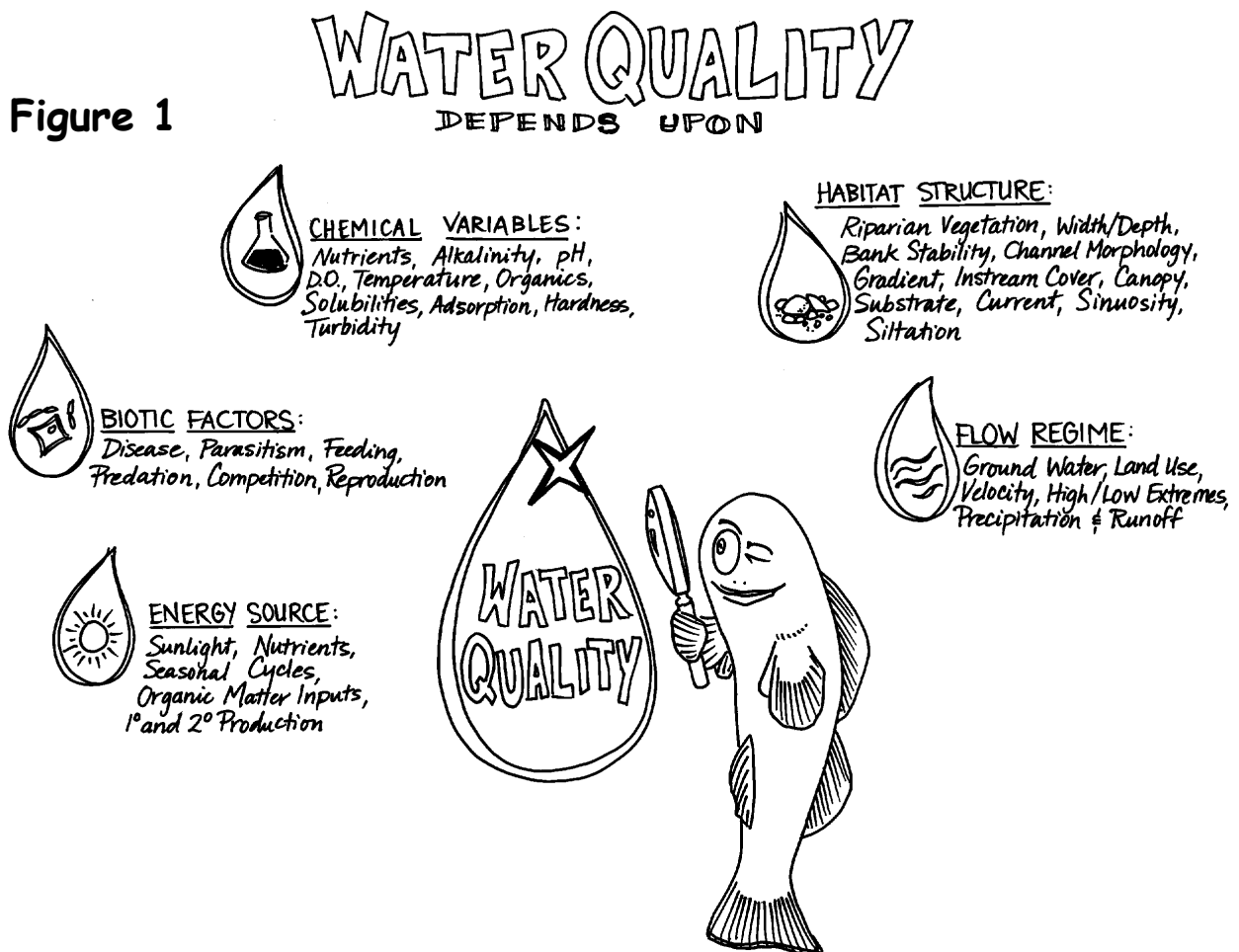
## What is trend monitoring?

Trend monitoring is the primary testing method used by Hoosier Riverwatch. To get an accurate picture of a stream's water quality, tests have to be performed on a regular basis, over a period of years. Trend monitoring provides a broad view of the stream allowing the seasonal variations to be sorted out from long-term changes. In order to obtain useful data for trend analysis, a group should consider the long-term commitment involved in this type of monitoring.

## What parameters are used to monitor water quality?

Water quality is determined by a variety of factors (See Figure 1). But due to time and resource constraints, Hoosier Riverwatch volunteers only monitor a fraction of the possible parameters. These parameters are listed below:

- Habitat** - land use, substrate, flow, depth, riparian vegetation, stream shape, erosion
- Chemical** - dissolved oxygen, *E. coli*, nitrate nitrogen, total phosphate, orthophosphate, turbidity, pH, biochemical oxygen demand (BOD), temperature change
- Biological** - benthic macroinvertebrates



# Safety



**Safety is the critical first step in any volunteer stream monitoring program. All volunteers should read the following safety precautions prior to beginning any monitoring activities.**

- ✓ **Take a buddy along!** Always monitor with at least one partner. Always let someone else know where you are, when you intend to return, and what to do if you do not return on time.
- ✓ **Honor private property rights.** Never cross a landowner's property without permission.
- ✓ **Never wade in swift or high water.** Do not wade if depth is greater than knee-deep. Do not monitor if the stream is at flood stage. Any stream is dangerous in times of flooding.
- ✓ **Never drink the water in a stream.** Bring water from home to drink. Wash with antibacterial soap and be wary when eating and drinking if your hands have been in contact with stream water.
- ✓ **Beware of polluted streams that are known to be unsafe for handling.** Check with your County Health Department or the Indiana Department of Environmental Management for information on bacterial and/or toxic contamination of local waterways. As a rule, treat every stream as if it were polluted - wear waders, rubber gloves, and protective eyewear.
- ✓ **Have a first aid kit on hand** (page 5). At least one team member should have first aid/CPR training.
- ✓ **Develop a safety plan.** Find out the location and telephone number of the nearest telephone and write it down. Locate the nearest medical center and write down directions for traveling there. Have each volunteer monitor complete a medical form that includes emergency contacts, insurance information, and pertinent health information such as allergies, diabetes, epilepsy, etc.
- ✓ **Listen to weather reports.** Never monitor if severe weather is predicted or if a storm occurs.
- ✓ **Be very careful when walking in the stream.** Wear shoes that are in good condition and have traction. Rocky-bottom streams can be very slippery and may contain deep pools. Muddy-bottom streams may also prove dangerous where mud, silt, and sand have accumulated in sinkholes. If you must cross the stream, use a walking stick to steady yourself. Watch for barbed wire fences or sharp, rusty objects (e.g., car bodies, appliances) that may pose a particular hazard.
- ✓ **Do not walk on unstable stream banks.** Disturbing these banks—including the vegetation growing upon them—can accelerate erosion and lead to a collapse.
- ✓ **Beware of animals.** Watch for irate dogs, farm animals, wildlife (e.g., snakes), and insects such as ticks, mosquitoes, and hornets. Know what to do if you are bitten or stung.
- ✓ **Beware of plants.** Watch for poison ivy, poison oak, sumac, and other skin-irritating vegetation.
- ✓ **If you drive, park in a safe location.** Be sure your car doesn't pose a hazard to other drivers and that you are not trespassing. If you are sampling from a bridge, take special precautions. Watch out for passing traffic and never lean over the bridge unless you are firmly anchored.

# Chemical Safety

The chemical reagents supplied in the testing kits are laboratory grade reagents. Some of the chemicals are concentrated, some are irritating, some are poisonous and some will just make you itch. Please read thoroughly the directions and the Materials Safety Data Sheets (MSDS) provided with each kit.

- ✓ **Wear safety goggles and rubber gloves.** Avoid contact between chemical reagents and your skin, eyes, nose, and mouth. Never use your fingers to stopper a bottle when shaking a solution.
- ✓ **Do not mix chemicals indiscriminately.** Use only the designated chemicals in specified amounts when performing tests.
- ✓ **Provide wash water** at the monitoring site to wash any chemicals from the eyes or the body.
- ✓ **Know chemical clean-up, disposal, and first aid procedures.** Wipe up all spills when they occur. Use sealed plastic containers filled with an absorbent material (e.g., kitty litter) to store waste before disposal. Separate hazardous waste (Hach nitrate kit) from all other waste. If accidental consumption of chemical reagents occurs, have your MSDS on hand and contact your local poison control office or one of the following:

## Phone numbers for EMERGENCY only:

Indiana Poison Control Center	1-800-382-9097
HACH Company	1-800-227-4224
Rocky Mountain Poison Center	1-800-623-5716

- ✓ **A first aid kit may not be enough.** In addition, carry such safety equipment as life buoys, life jackets, river rescue throw bag, a flashlight, a whistle, and **insect repellent**.

## First Aid Kit

### Your first aid kit should contain the following items (at a minimum):

- ☐ Telephone numbers of emergency personnel
- ☐ Several Band-Aids for minor cuts
- ☐ Antibacterial soap or alcohol wipes
- ☐ First aid cream or ointment
- ☐ Several gauze pads 3-4" square for deep wounds with excessive bleeding
- ☐ Aspirin or other pain reliever/fever reducer
- ☐ A needle and tweezers for removing splinters
- ☐ A first aid manual that outlines diagnosis and treatment procedures
- ☐ A single-edged razor blade for minor surgery and cutting tape to size
- ☐ A 2" roll of gauze and a triangular bandage for large wounds
- ☐ A large compress bandage to hold a dressing in place
- ☐ A 3" wide elastic band for sprains, applying pressure to bleeding wounds
- ☐ If a participant is sensitive to bee stings, include their doctor-prescribed antihistamine
- ☐ An eyewash to flush chemicals

These guidelines were adapted from the Environmental Protection Agency's 1997 *Volunteer Stream Monitoring Manual*.

